WHAT IS CLAIMED IS:

1. A reference electrode comprising:

a conductive substrate having a first surface; and

an ionically insulating, hydrophobic layer adjacent to the first surface having a plurality of non-selective ion exchange sites.

2. The reference electrode according to claim 1, wherein the ionically insulating, hydrophobic layer comprises polytetrafluoroethylene.

3. The reference electrode according to claim 1, wherein the conductive substrate is silicon.

4. The reference electrode according to claim 1, wherein the conductive substrate includes a metal.

5. The reference electrode according to claim 1, wherein the conductive substrate includes a non-conductive substrate with a conductive layer provided thereon.

6. The reference electrode according to claim 1, wherein the ionically insulating, hydrophobic layer has a thickness of less than 1 micron.

7. The reference electrode according to claim 1, further comprising an adhesion promoter disposed between the conductive substrate and the ionically insulating, hydrophobic layer.

8. The reference electrode according to claim 7, wherein the adhesion promoter comprises a siloxane.

9. The reference electrode according to claim 1, wherein the plurality of non-selective ion exchange sites comprises zeolyte.

10. The reference electrode according to claim 1, wherein the conductive substrate is electrically coupled to an amplifier.

11. The reference electrode according to claim 1, wherein the conductive substrate is electrically coupled to a field effect transistor.

12. A reference electrode comprising:

a conductive substrate having a first surface; and

an ionically insulating, hydrophobic layer adjacent to the first surface; and

a non-selective ion exchange layer disposed on or in the ionically insulating, hydrophobic layer.

13. The reference electrode according to claim 10, wherein the ionically insulating, hydrophobic layer comprises polytetrafluoroethylene.

14. The reference electrode according to claim 10, wherein the conductive substrate is silicon.

15. The reference electrode according to claim 10, wherein the conductive substrate includes a metal.

16. The reference electrode according to claim 10, wherein the conductive substrate includes a non-conductive substrate with a conductive layer provided thereon.

17. The reference electrode according to claim 10, wherein the ionically insulating, hydrophobic layer has a thickness of less than 1 micron.

18. The reference electrode according to claim 10, further comprising an adhesion promoter disposed between the conductive substrate and the ionically insulating, hydrophobic layer.

19. The reference electrode according to claim 18, wherein the adhesion promoter comprises a siloxane.

20. The reference electrode according to claim 10, wherein the non-selective ion exchange layer comprises zeolyte.

21. The reference electrode according to claim 10, wherein the conductive substrate is electrically coupled to an amplifier.

22. The reference electrode according to claim 10, wherein the conductive substrate is electrically coupled to a field effect transistor.

23. A reference electrode comprising:

a conductive substrate having a first surface; and

an ionically insulating, hydrophobic layer adjacent to the first surface; and

a non-selective ion exchange zeolyte layer disposed on or in the ionically insulating, hydrophobic layer.

24. The reference electrode according to claim 23, wherein the ionically insulating, hydrophobic layer comprises polytetrafluoroethylene.

25. The reference electrode according to claim 23, wherein the conductive substrate is silicon.

26. The reference electrode according to claim 23, wherein the ionically insulating, hydrophobic layer has a thickness of less than 1 micron.

27. The reference electrode according to claim 23, further comprising an adhesion promoter disposed between the conductive substrate and the ionically insulating, hydrophobic layer.

28. The reference electrode according to claim 27, wherein the adhesion promoter comprises a siloxane.

29. The reference electrode according to claim 23, wherein the conductive substrate is electrically coupled to an amplifier.

30. The reference electrode according to claim 23, wherein the conductive substrate is electrically coupled to a field effect transistor.

31. A reference electrode comprising:

a conductive substrate having a first surface;

an ionically insulating, hydrophobic layer adjacent to the first surface having a plurality of non-selective ion exchange sites; and

a field effect transistor having a gate, source, drain and substrate, wherein the conductive substrate is electrically connected to a substrate of the field effect transistor.

32. The reference electrode according to claim 31, wherein the ionically insulating, hydrophobic layer comprises polytetrafluoroethylene.

33. The reference electrode according to claim 31, wherein the conductive substrate is silicon.

34. The reference electrode according to claim 31, wherein the conductive substrate includes a metal.

35 The reference electrode according to claim 31, wherein the conductive substrate includes a non-conductive substrate with a conductive layer provided thereon.

36. The reference electrode according to claim 31, wherein the ionically insulating, hydrophobic layer has a thickness of less than 1 micron.

37. The reference electrode according to claim 31, further comprising an adhesion promoter disposed between the conductive substrate and the ionically insulating, hydrophobic layer.

38. The reference electrode according to claim 37, wherein the adhesion promoter comprises a siloxane.

39. The reference electrode according to claim 31, wherein the ionically insulating, hydrophobic layer comprises zeolyte.